**Economics Education and Research Consortium**

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# An analysis of wage arrears of coal enterprises

## Summary

This project utilizes panel data for 70 coal enterprises of Kuzbas region that *were fully established and operated continuously* between 1996 and 1998, and finds empirical evidence that negative supply shocks, liquidity problems in the region, efficiency of coal enterprises, and specific features of external opportunities in labor markets influence the occurrences of wage arrears. This work draws several major conclusions for Kuzbas region: (1) wage arrears have negative relation to demand for the output of the enterprise and are sensitive to efficiency of the enterprise, which is measured through profit/loss variable; (2) high regional average for wage arrears increases the probability that wage underpayments in a particular enterprise in this region have chronic nature; (3) the firms making a decision to withhold wages are taking into account the volume of sales and wage levels in the enterprise in previous periods. Also the form of ownership exerts the influence on the decision delay payments**.**

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**Contents**

## 1. The Issue

Wage arrears are one of insidious responses of the Russian labor market to the process of economic transition. Seemingly, they are caused by the collapse of the fiscal system, gradually acquiring chronic nature and becoming a characteristic feature of regional economy. Wage arrears are an essential factor exacerbating social conflicts as they cut real incomes of certain population groups and increase the already high wage polarization in Russia (Lehmann, Wadsworth and Yemtsov, 2000). The most conspicuous is the relationship between the growth in wage arrears and social tensions in Kuzbas. Workers' strikes in this coal region caused by wage non-payment have become a pressing political factor over the years of reforms.

It so happened historically that in Russia over a half of coal output is generated in Siberia, just in Kuzbas region. In preparation of decisions about coal sector reform the voice of regional bosses is well audible. They use wage arrears and stemming social tensions as an argument to get government subsidies, budgetary financing and investment loans. In this context the problem of wage arrears incidence has a special weight.

The discussion of issues related to non-payments to employees often turns into propaganda of interests of various political and lobbyist groups. Because of this political setting, an analysis of the nature of wage arrears becomes of particular importance.

Researchers who analyze the problem of arrears note that first occurrences of this problem were observed in 1994. According to the data of Goskomstat of Russia (http://www.info.gks.ru), wage arrears in Russian economy as a whole were increasing between 1994 and 1999. In October of 1998 growth rates of the aggregated indicator for wage arrears went down compared to the previous month. In August of

1999 the aggregated indicator decreased in absolute value from the level of the previous month. In January of 2000 the total wage arrears amounted to 31 690 million roubles. Evidently, the situation with wage arrears improved in the last two years, and this improvement is related to the post-crisis revival of Russian economy.

In the meantime, mechanisms that caused large-scale growth of wage arrears in response to demand shocks continue to exist even in the relatively improved economic conditions. Decreased growth rates of gross output in the first quarter of 2001 were accompanied by a 2.5 % growth in the aggregated indicator for wage arrears (compared to the same period in 2000).

Studies that examine wage arrears stress that the problem of wholesale non-payments to employees is specific to Russian economy when in other transitional economies wage arrears not widely spread and incident firms in bankruptcy (Earl and Sabirianova, 1998). Alfandari and Schaffer (1996) analyze the problem of debts of Russian enterprises and note that the overdue amounts to government budgets, financial institutions and trade (inter-enterprise) credit in Russia are comparable to the level of similar debts in other transitional economies, while wage arrears in Russia are of extraordinary scale.

This peculiar feature of economic transition in Russia can probably be attributed to the existence of two factors – on the one hand, underdevelopment of regional labor markets, and, on the other hand, inertia of large enterprises, which were created as part of the centralized scheme of production location and regional specialization. This type of enterprises has most difficulties in adjustment to demand limitations that accompany crises of transitional periods. Several studies of the problem of arrears confirm that this type of enterprises withhold payments to their employees more frequently than other types of enterprises.

A portrait enterprise been employment in this one should be in arrears has already been drawn: it is large and old in terms of its foundation date (Earle and Sabirianova, 1998), located in provincial region (Lehmann et al, 1999, Alfandari and Schaffer, 1996), it belongs to a base industry such as resource extraction and manufacturing of industrial goods, and is owned by federal government (Lehmann et al, 1999).

The object of analysis in this study will be Siberian coal mining enterprises. They possess all the characteristic features listed above and represent typical wage non-payers.

The majority of studies that deal with arrears is based on the analysis of the behavior of individuals. The approach in these studies is to examine the probability for an employee not to receive his or her wage on time and to establish factors that affect this probability – individual characteristics of the employee, characteristics of the enterprise and regional factors. (Earle and Sabirianova,1 998, Lehmann et al, 1999, Desai and Idson, 1998).

The study by Gilles Alfandari and Mark E. Schaffer (1996) conducts an analysis of wage arrears as behavior of enterprises. This paper examines wage arrears along with other arrears of an enterprise and draws the conclusion that wage arrears, as opposed to tax arrears, are not associated with financially distressed enterprises.

Our study is based on the ideas proposed in previous studies of wage arrears. At the same time it is different from studies of labor markets because it analyzes the behavior of enterprises. In other words, this paper addresses the question: Why do enterprises withhold wage payments? At the same time this paper does not attempt to answer the question: Why do employees agree not to receive wages?

In the most general form, the objective of this paper is to establish reasons for wage arrears in coal enterprises by using empirical data on the performance of Kuzbas mines and quarries. To answer this question, we must identify the determinants of wage arrears and the directions in which reductions in demand, the problem of underpayments, institutional factors and external employment opportunities influence the incidence of debts.

## 2. Problem Background

### The Influence of the Government

In the minds of both regional leaders and miners wage arrears are caused by government policy in this industry. The main feature of this policy is government subsidies. These subsidies include:

- measures on closing unprofitable mines;
- service benefits to surplus workers;
- safety measures in coal-mining ;
- selective support of loss-making enterprises;
- implementation of tariff agreements.

Since 1997 the proportion of funds assigned by the state to implementation of tariff agreements has markedly decreased (Table A.3, Appendix A).

Tariff agreement is the share of work remuneration that is guaranteed by the state (in 1999 this share stood on average at 30 % of the total wage fund). The tariff agreement between Trade Unions (on behalf of employees), MinTopEnergo (on behalf of employers) [1] and Ministry of Labor and Social Protection (on behalf of the state) is to be renewed every year. The subsidy within the tariff agreement is given per one ton of planned coal output, and output in excess of the planned level is not taken

[1] The "Association of Coal Producers" in the first tariff agreement of 1999.

into consideration. According to the law, the amount of resources designated within the tariff agreement does not depend on the share of government ownership of the enterprise. However, the analysis of funds assignation schedule in the first half of 1999 shows that there are some firms left without state support. Also, the tariff contract includes a system of bonuses tied to firm's performance.

An important factor for wage arrears is adherence to financing schedule. Irregular financing of tariff agreements caused an increase of strikes in 1996-97. The fundamental demand of strikers was and remains to be payment of wage arrears.

The government learned its lesson from the conflicts. With the general reduction of budget financing, the amount of government funds designated for tariff agreements decreased. In addition, starting from 1998, a new scheme of budgetary financing of coal industry was introduced. Any recipient – a coal company, a mine to be closed, administration of a mining community – can now get its subsidies only on the basis of agreements confirmed by Russian MinTopEnergo (Ministry of Fuel and Energy). Subsidies as well as severance benefits to surplus workers are sent through channels of state treasury to their individual recipients.

The analysis of database of coal enterprises of Kuzbas for 1998 shows that non-payments from budgets of all levels are insignificant in the structure of wage arrears (Table 4, Appendix A).

**Organizational Forms of the Industry and Privatization Policy**

Coal industry was one of the earliest to enter the process of reformation, which is still underway. The brief story of these reforms is as follows.

After the strikes that took place in 1989-1991, mines, quarries and auxiliary enterprises were the first ones in the country to be reorganized to joint-stock companies, withdrawn from state control and given juridical status. Typically,

associations of enterprises were transformed to "soft" holdings that had no effective instruments of management. Mines, although legally in state ownership, were actually controlled by their directors. This market began to be filled with a vast number of businessmen often mixed up with criminal groups.

In 1993 the government decided to liberalize (deregulate) prices for the products of coal enterprises, and coal enterprises immediately began to suffer liquidity problems.

In 1996 it became quite clear that to solve this problem mines and quarries should become industrial units of strong market agents, that is, competitive coal companies set up on the basis of old associations of enterprises. In 1993 the total coal output was produced by 262 individual mines, and in 1998 74 % of coal was produced by 30 regional coal companies[2]. No unprofitable or unpromising mines were included in the formation of these companies, and the government took on itself obligations connected with the closures.

Active privatization policy is taking place in the industry today. As a result of this policy, the government intends to sell control of the majority coal enterprises in Kuzbas.

At the same time, the government will preserve the right to interfere into the activities of coal enterprises through the institution of "golden stocks." At present the question of transferring control over the "golden stocks" to regional management is being heavily debated in different government structures and regional press.

The necessity of government support for coal industry, which is related to a complex of problems in Russian economy, results in a situation where coal enterprises are incapable of conducting independent economic policy even after privatization and

[2] National average if not specified otherwise

are involved in various vertical management structures. For example, regional structures substitute organizations such as “Rosugol,” which was eliminated by federal decree. Without doubt, this process affects economic behavior of enterprises as a whole, and the situation with wage arrears, in particular.

**Demand for the Output of Coal Industry**

In 1998 coal production saw a growth brought about, in our opinion, by growing domestic demand, and this tendency continues. Besides, the scenario of Russian short-term Energy Strategy that is now being considered suggests an increased share of coal in the national fuel balance. Cheaper and more easily obtained coal will be substituted for natural gas due to increasing natural gas prices and changing price proportions between fuel oil, gas and coal used in the generation of energy and heat. In consequence, the upward trend for coal demand indicates not only recovery from depression but a long-term tendency of coal prevalence in fuel balances of Russian regions. The market of Kuzbas coals extends to Siberia, Ural, and European part of the country. Variegated quality of Kuzbas coals ensures a wide range of its consumers.

Demand for Kuzbaz coal is not monopolized by one consumer or a group of consumers. This circumstance makes the market for coal competitive and transparent, which presents a factor for growth in efficiency for Kuzbas coal enterprises.

**Economic Indicators of Coal Industry**

It might sound like a paradox, but growth in coal demand does not solve financial problems of coal enterprises. The current situation in the industry has been called “difficult” (Astakhov, 2001). Monetary (as opposed to barter and offsets) payments of electric power generating plants remain at the level of 16-18 %. Tax arrears and other underpayments into non-budget funds are 4-13 times more than

receivables. Average industry wage arrears to coal miners constitute approximately four months of wages.

An analysis of a selected group of enterprises that amount to 96 % of coal extraction in Kuzbas reveals that credit arrears per employee grew significantly (see Appendix A4) along with an increase in output sales (shipped output). At the same time there exist some positive tendencies: the number of profit-making enterprises increased, and wage arrears decreased from 3.9 to 2.2 monthly wages.

**Specific Features of the Local Labor Markets**

The development of Kuzbas began after the end of World War II. Out of 224 million tones of coal produced nationally in 1998, 94 million tones were mined in Kuzbas. The coal industry is presented by nine coal-producing regions with about 100 mines and a great number of mining communities. The share of coal sector stands at 38 % of the total industrial output. Coal enterprises are dispersed in remote areas away from industrial centers. This circumstance is usually credited with the existence of monopsony power in local labor markets. It can be speculated that in a mining community that offers employment only in coal production and is located far from industrial centers, external employment opportunities are scarce, which allows enterprises not to pay to their workers. However, a closer look reveals that the share of workers employed in a single enterprise does not exceed 5 % of total employment in a local labor market. The following situation is possible: aggregate demand in local labor market consists of only coal enterprises, but each individual enterprise does not have monopsony power in any local labor market.

It is necessary to note that traditionally Kuzbas workers willingly go on strike and have influential trade unions, which suggests that coal workers have certain monopoly power in the labor market.

## 3. Literature Review

### Theoretical Background

As it has already been noted above, wage arrears have been extensively studied. There exist several viewpoints of the wage arrears incidence.

1) "A theory of wage flexibility" - according to this theory, R. Layard and A. Richter (1995) suggest that wage arrears actually enable the reductions in wages without decreasing wages nominally. In short, wage arrears are a method to make wages more flexible.

2) "A theory of the shortage of money" - S. Clarke (1997) suggests that the most important determinant for the scale of wage arrears is the proximity to cash sales, with the lowest delays being in the food and transport industries and in oil refining. He also states that the main reason for non-payment is not the willful negligence or corruption of managers and officials, but the lack of funds. In this view, the shortage of liquidity in enterprises is stressed.

3) "A theory of the crime of finance and politics" - V. Gimpelson (1998) indicates that the major determinants of all types of arrears is to be sought in incomplete fiscal adjustment and lack of the political will to ensure financial discipline. To some extent, Alfandari and Schaffer (1996) present similar arguments. They assume that enterprises use arrears to obtain tax breaks and other privileges from the government.

4) "A theory of dependence on regions". J. Earle and K. Sabirianova show in their empirical study that wage arrears have regional characteristics. They conclude that the degree to which firms use arrears is negatively related to performance measures for firms and regions, as well as liquidity, forms of private ownership and recent founding date of the firm, and positively related to concentration in

local labor markets. Lehmann (Lehman., at al 1998) suggests that large regional variation of wage arrears depend on the industrial structure, extent market transformation and regional government relationship with the center.

## 4. Setting the Hypotheses

Our study is based on the conclusion made by Alfandari and Schaffer (1996). The later paper examines non-payments, including wage arrears, and assumes that the nature of wage arrears is similar to the nature of non-payments to government budgets and other economic agents. The authors relate the existence of all kind non-payments to financial instability of enterprises. At the same time they note that managers of enterprises tend not to pay wages to a larger extent than to the government or other economic agents, *ceteris paribus.*

The fact that the dynamics of wage arrears is different from the dynamics of other non-payments, noted by Alfandari and Schaffer, deserves explanation. We believe that higher and more systematic wage arrears compared to other non-payments is associated with two circumstances in Russian economy. First, during crisis enterprises in the face decrease of demand make efforts to decrease their wage costs using most available means. Second, underdeveloped regional labor markets do allow enterprises to decrease their costs by not paying wages to their own employees. Low mobility of labor force, high unemployment thereby failure external opportunities employments make it convenient for enterprises to use wage arrears as means of cutting their expenses. Nature of wage arrears bound up with practice when withholding wage payments became encourage management strategy. The working paper (Earl, Sabirianova, 2000) devotes to analysis this appearance. The authors

provided evidence that higher wage arrears in the local labor market attenuate worker's feedback state in his/her morale and effort, the quit probability, the strike probability and the probability that a legal penalty will be assessed. Furthermore, the analysis provided evidence of positive relation between the manager's strategy delay wage and the behavior of other firms operating in the same local labor market.

Therefore, we can name two groups of factors that affect the occurrence of wage arrears in enterprises:

1) factors, related to economic behavior of enterprises;

2) factors, related to conditions of local labor markets. We need to analyze the influence of these factors more closely.

From the economic theory, the first thing to be considered among the factors influencing the incidence of wage arrears is the reduction and restructuring of demand for the output of coal enterprises. Empirically, Alfandari and Schaffer, who found the connection between the demand and arrears, confirmed this relation: the later seemed to be concentrated in enterprises that experience reduction in demand. The fall in the output causes contraction in the demand for the products used in the generation of energy, although to a lesser degree than might be expected. A more sensitive to reduction is the share of "cash" in shipment contracts, which characterizes the general level of liquidity in the region. While payables for enterprises are associated with demand and can be paid in different ways, including cash, barter and mutual offsets, wages are more difficult to pay with non-cash methods. That is why the share of cash in contracts obviously determines the level of wage payments.

An empirical evidence of mutual dependence between wage arrears and the level of liquidity in the region is given by the work of Earle and Sabirianova (1998). In order to measure bank liquidity in the region, authors made a survey of the time

interval that is needed to receive an equivalent of $ 200 in cash in local bank They define bank liquidity as a dummy variable equal to one if the money could be withdrawn immediately. For measure oblast-level liquidity was taken a few measures: foreign currency turnover, retail triad turnover, bank credit per capita. Alfandari and Schaffer to examined liquidity in the light of firm's performance and measure liquidity as the value of monetary reserves (cash and bank deposits). The authors found a significant negative relation between the state of monetary reserves and non-payments by enterprises. Because of the specific features of coal enterprises, we measure the degree of liquidity through monetary assets of enterprises in electric energy sector. The analysis of receivables of coal enterprises shows that 46 % are associated with electric power generating plants. In the chain for the market of electric power – consumers, producers and input suppliers – coal enterprises are the last. According to this chain, they are paid last. As a result, wage arrears of coal enterprises depend on effective demand for heat and electric power.

While demand restrictions increase the probability of the occurrence of arrears, no definite conclusion is drawn about the effect of financial state of the enterprise. Alfandari and Schaffer do not find any relation between arrears and financial conditions, measured by the difference between assets and liabilities. Nevertheless, we should expect a connection between financial success of the enterprise and its strategy to pay wages on time. Alfandari and Schaffer point to this conclusion by showing that wage arrears concentrate in enterprises with low wages (most likely, least effective).

Efficiency of an enterprise is connected to the dynamics of overdue payments. The paper (Alfandari and Schaffer, 1996) propose a hypothesis that magnitude of wage arrears account for negotiations between the enterprise and the government, in

which payments of wage arrears are tied to payments of tax arrears, and wage arrears are used as a pressure tool to receive tax breaks. Neither paper tests this hypothesis empirically. We analyze this hypothesis by checking whether the reduction in tax arrears takes place when wage arrears are high.

In our opinion, efficiency of an enterprise measured by its profitability should be related to wage arrears. Theoretically, coal enterprises maximize profits. They want their employees to be efficient and therefore, tend to pay on time and better wages. At the same time, enterprises under bankruptcy procedures or in the state of financial distress might not have any arrears (Gimpelson and Lippoldt, 1996, Alfandari and Schaffer, 1996). We assume that privatized enterprises operate in the framework of the traditional economic paradigm and maximize their profits. Therefore, this type of enterprises, compared to government owned enterprises, tends to be more efficient and pay wages on time in order to create efficiency incentives for their employees. Lehmann (Lehman., at al 1998) had assigned that incident of arrears lower in the new private sector. At once in the region outside Moscow, the level withhold wages in the private firms is much higher. Earle and Sabirianova (1998) also notice that regional variation may be more important then firm variation for understanding wage arrears. Researchers connected the high levels regional variation of wage arrears with conditions in a local labor market. Lehmann at al (Lehman., at al 1998) measuring regional variation in basis regional level data ( in analysis involve 7 large regions and capital). Earl, Sabirianova (1998) used more detailed data set (40 *raionov* involving in RLMS). The effect conditions of a local labor market on wage arrears depend on worker's outside options limited relocation cost. Thereby labor market of city or *raion* taken as local, which define some number measures. They include general characteristics of regional labor market that people use when

evaluating advantages or disadvantages of their job (unemployment, average regional wage). High average wage in the region implies availability of outside options for the workers, while high regional unemployment make them more tolerant to non-payments on their current job.

Earle and Sabirianova (2000) had suggested a model of managerial choice in result it to adopt decision withhold wages. They show, that level of wage arrears in the enterprise is relating to the incidence delays on the other firm operation in the same labor market. Pursuance this model, we assume regard wage arrears as key measure conditions of the regional labor market**.**

**5. The Data**

The majority of empirical studies of wage arrears is based on household survey databases (RLMS, RIFS), and on some additional data from Goskomstat. The work by Alfandari and Schaffer (1996) differs from most works because it utilizes mainly official aggregated statistical information of Goskomstat and World Bank survey of business activity of Russian enterprises. Our study is based on disaggregated data obtained from Kemerovo region statistical office. The official statistics on wage arrears published by the Russian Goskomstat are not quite satisfactory. They contain only aggregate data on accumulated arrears in different sectors of the economy. At the same time, regional statistical offices collect all enterprise-level data from the region in a form of current statistical records, and aggregate indicators are based on these data. Our data sources include balance-sheets of enterprises; reporting forms of statistical records – “labor and wages,” “profits,” “payables;” handbooks on social and economic conditions of Kuzbas region. Regional-level data are collected in complete count, on all enterprises of coal industry.

We have a panel of data covering 1996, 1997 and 1998 for 103 firms of Kuzbas coal industry. Because of the purpose of our analysis we choose enterprises directly engaged in coal production. Since coal industry has been under the process of restructuring, there has been a group of firms that were closed during the period of observation, or are going to be closed. Enterprises that are being closed are losing the number of workers, which leads to growth in arrears per employee. These firms were excluded from the analysis. We also excluded new enterprises that started their activity in 1997-1998 since the number of their employees has also been unstable. As a result, we include in our analysis 70 enterprises that were stable during the period of study. The share of coal extraction in these enterprises amounts to 94 % of the total coal extraction in Kuzbass region in 1998.

For each enterprise we collect data on wage arrears at the end of the month, volume of the shipped product, the number of employees, pre-tax profit, wage fund and some other variables. All money indicators are expressed in thousand roubles (deflated to roubles of January 1996 through regional consumer price indices). The existing system of accounting is a sufficiently reliable source of the statistics on labor and wages, as well as physical indicators. Financial indicators of efficiency such as profits, contain a "shadow" (measurement error) component. Because of the current pricing and financing mechanisms, firms have incentives to under-report their efficiency by exaggerating prime costs of production. If we assume that this "shadow" component is a fixed or slowly changing condition in enterprises activity, we can still use financial data to measure relative efficiency

## 6. The Variables

### 6.1. Measurement of Wage Arrears

In statistical records, wage arrears appear as *"stale debt at the beginning of*

*month"* and is measured as totals, that is, arrears incurred in the past plus their increase for the month. The current wage arrears already assessed and entered in the wage fund but not yet paid are not included in this indicator. If the enterprise pays wages in full during the reporting month, there is no increase in arrears. Arrears have to be paid in addition to the current payroll. Since the wage fund is associated with the number of employees and average wage, then the division of the arrears by wage fund scales the dependent variable concurrently to the number of employees and average wage. It seems more reasonable to include in our model the dependent variable measured as scaled arrears. The average wage in this case can be considered as one of the explanatory variables.

The main variable used to measure wage arrears is constructed according to the following formula:

Scaled stock of arrears:

$$WA'_t = \frac{wa_t}{N_t}$$

where $wa_t$ is accumulated wage arrears at the end of month *t*;

$N_t$ is the number of employees in the same period.

To use devoted to employees wage arrears we be able analyze stock wage arrears in enterprises.

We include another variable in the model. In our view, of a special scholarly interest is to answer the question: What criteria do enterprise managers use when deciding not to pay wages in the current month? We can't answer in this question using as variable scaled stock wage arrears**.** Three scenarios of enterprise behavior are possible: 1 – arrears unchanged, 2 – arrears increase, 3 – arrears decrease. Since the number of employees, as well as wage rates, is changing, we do not have any

observations with unchanged arrears. Therefore, we can measure changes in arrears through a dummy variable that takes the value of 1 if debt increased, and 0 if wage debt decreased. The wage debt measured in this way will, in our view, reveal the relationship between the enterprise performance and the making decision delay wages.

### 6.2. Measurement of Factors Influencing the Incidence of Wage Arrears

The total demand for the output of an enterprise is estimated by variable *"total shipment"* (*SALE*) that includes all forms of settlements for the products: barter, mutual offsets, bills, and cash payments. This indicator coincides with total sale of the primary product of enterprise activity (coal extraction). Realized output is more directed to the future compared to produced output and less predetermined by its pre-history; besides, it is less prone to manipulations and more transparent for outside observers. We use total shipment per enterprise converted to "fixed" roubles by means of price indices.

The data on the share of cash settlements are not present in realized sales. Since electric power generation is the main debtor of coal industry, we use variable *wage arrears in electric power production* (*NONLIQUID*) to estimate cash effective demand. Following Clarke (1997) we presume that the reason for wage arrears is the lack of "cash" funds in the enterprise.

This variable is estimated as

$$NONLIQUID_t = \frac{wae_t}{N_t},$$

where $wae_t$ is arrears in electric power generation in Kuzbas as a whole in period *t*;

$N_t$ is the number of employees in electric power generation in Kuzbas as a whole.

We measure enterprise performance by variable *profit/loss per employee* (*PROFIT*). As in the Russian context taxes are often changed, we use pre-tax profit and deliberately use the balance-sheet profit (in contrast to profit from primary activity) in order to include the outcome of entrepreneurial risks of enterprise managers.

Non-payments to government budgets are measured by the balance-sheet indicator – *overdue payments to budgets of all levels* (*PAYABLE*).

Opportunities of the regional labor markets are measured through *average wage in the city* (*WCITY*) and *average wage arrears in the raion* (*WACITY*).

Observed enterprises sit either in the city or *raion* of Kemerovskay oblast. We regard city or raion as the local labor market. The city and raion statistical records about wage arrears and average wages are using as WCITY and WACITY variables. Data observed on enterprises don't use for contraction variables WCITY and WACITY. For contraction this variables we divided city and raion statistical records by employment in economics city or raion.

In order to capture institutional effects of private ownership, which is expected to stimulate efficiency, we include variable *private ownership of enterprise* (*OWNERSHIP*) among the explanatory variables for wage arrears. In our sample, enterprises of four forms of ownership are present: full private ownership, full government ownership, partial foreign ownership (two enterprises) and mixed ownership (with participation of the state). Many enterprises with mixed ownership are *de facto* owned privately since the shares that belong to the state were given to private co-owners in temporary management. Therefore, not only fully private

enterprises, but also enterprises with mixed property are likely to experience institutional effects of private property.

Our work uses assumptions listed above and a unique dataset on 70 coal enterprises in Kuzbas to test the following hypotheses:

1. Wage arrears are negatively related to the level of demand for coal. If the data support this hypothesis, it would confirm the widespread view that wage non-payments are connected to demand restrictions.

2. The share of cash compensation in total sales is related to the problem of wage arrears, which means that wage arrears have negative relation to the level of liquidity in the region or positive relation to the level non-liquidity**.**

3. Wage arrears are affected by efficiency of the enterprise. Relatively more profitable enterprises are expected to have lower probability of wage arrears. Here we also check the result of Alfandari and Schaffer that wage arrears are concentrated in enterprises that have relatively lower wages.

4. Since privately owned enterprises maximize profits, they have more incentives to stimulate efficiency of their employees, and therefore, the probability of wage arrears in private enterprises should be lower than in enterprises of other ownership types.

5. We expect that wage arrears more frequently occur in enterprises that attempt to reduce their arrears to government budgets. Even if we find empirical support for this hypothesis, we will not be able to conclude that wage non-payments serve as means of cutting other tax arrears. However, it will become clear that tax arrears and wage arrears compete with each other when enterprise managers make their decisions on payments.

6. Wage arrears for a particular enterprise depend on the conditions of local labor markets. We expect that growth in average wage level in the region is negatively

related to wage arrears in enterprises, while growth in average wage arrears in the region is positively related to wage arrears in each individual enterprise.

7. Lastly, we test whether factors that determine the existence of wage arrears differ from the factors that determine the persistence of wage arrears and define enterprises that are chronic non-payers of wages.

## 7. Modeling Wage Arrears

### 7.1 Model Specifications

We use the set of panel data on coal enterprises of Kuzbas. The analysis of panel data is one of the most fruitful and innovative directions in the econometrics literature. As was noted by Greene (1995), a combination of time-series and cross-section data enables examination of issues that cannot be studied separately either in cross-sectional, or time series samples. Panel data make it possible to model heterogeneity of groups and units typical for microeconomic data.

We analyze our dataset from three directions using three different dependent variables. At first, we focus on the flow of wage arrears (least squares models). Then we use discrete choice models to estimate the probability of having wage arrears (logit and probit models), as well as the probability of having arrears of different severity (ordered probit).

**Linear Specifications**

We estimate flow wage arrears by using classical OLS model, and then, the model with fixed effects, where we assume that fixed effects capture specific characteristics of each enterprise. We test the validity of the fixed effect model by means of F-test for the hypothesis that fixed effects are jointly insignificant. We also compare models with fixed effects versus random effects through Hausman specification test.

The model with fixed effects is as follows:

$$y_{it} = \alpha_i + X_{it}\beta + \varepsilon_{it} \qquad (1)$$

where $y_{it}$ – the dependent variable for enterprise *i* in period *t*;

$X_{it}$ – the matrix of explanatory variables, excluding the intercept;

$\alpha_i$ – fixed effect for enterprise *i*: a parameter that varies by enterprise but is constant over time;

$\varepsilon_{it}$ – an error term: independent and identically distributed random variables with mean zero and variance $\sigma_\varepsilon^2$ .

We estimate the following base specification of the model that explains the behavior of flow wage arrears:

$$\begin{aligned} WA_{it} = {} & CONS + \beta_1 OWNERSHIP + \beta_2 WAGE + \beta_3 PROFIT + \beta_4 SALE \\ & + \beta_5 PAYABLE + \beta_6 LIQUID + \beta_7 WACITY + \beta_8 WCITY + \varepsilon \end{aligned} \qquad (2)$$

where all variables are defined in Appendix B, Table B.1

**Discrete Choice Specifications**

In order to estimate the influence of different factors on the probability of having wage arrears, we use binary choice models. The choice is the decision of the enterprise whether to pay or not to pay wages in the current period. Generally this choice is a random variable described by the following conditional probability, where $x_i$ is a vector of explanatory variables, and $\beta$ is a vector of unknown parameters:

$$P\{y_i = 1 \mid x_i\} = G(x_i'\beta),$$

Obviously, function G (.) should be bounded by 0 and 1 to represent probability. If we assume that G (.) is a cumulative density function of the standard normal distribution, then we have the probit model:

$$G(w) = \Phi(w) = \int_{-\infty}^{w} \frac{1}{\sqrt{2\pi}} \exp\left\{-\frac{1}{2}t^2\right\} dt \ ,$$

Alternatively, we can assume that G (.) is a logistic distribution, which results in the logit model:

$$G(w) = L(w) = \frac{e^w}{1+e^w} \ ,$$

Parameter estimates for $\beta$, obtained from probit or logit models, cannot be interpreted directly apart from their sign. In order to do such interpretations and compare the effects of different explanatory variables, we derive their marginal effects. Following the standard practice, when calculating numerical values for the marginal effects, we evaluate them at the sample means of the explanatory variables $x_{i.}$.

The formulas for the marginal effects follow (Verbeek, 2000, p.314):

Probit: $$\frac{\partial \Phi(x_i'\beta)}{\partial x_{ik}} = \Phi(x_i'\beta)\beta_k \ ,$$

Logit: $$\frac{\partial L(x_i'\beta)}{\partial x_{ik}} = \frac{e^{x_i'\beta}}{\left(1+e^{x_i'\beta}\right)^2}\beta_k$$

Our dataset allows us to work with model estimated both quarterly and monthly information. In the case OLS regression and fixed effect model we must get the same results. We may conjecture merely that model estimated on monthly data will be more exactly as we deal with greatest data. In the case probit model we have quality difference between monthly and quarterly models. Because quarterly dummy as measures of probability wage arrears will be average beside monthly dummy. Accordingly we will use both monthly and quarterly data considering particularity constriction dependent variable.

Under analysis economic measures is appear question about influence time on this measures. We estimated model included monthly and quarterly dummy towards control influence of time. Estimate model reveal that time variable do not affect on wage arrears in condition our models ( F-statistic attached in table C-1).

### 7.2 Estimation Results

#### Linear Models

Columns two and three of Table C-1, Appendix 3, present OLS estimates of the parameters for the model with wage arrears flow as the dependent variable. These results give preliminary support for most hypotheses proposed in this project. There is a negative relationship between wage arrears and the following factors: private ownership, the enterprise wage level, its profitability, and demand for the output of the enterprise. Tax arrears of the enterprise have positive effect on its wage arrears. Since the level of tax arrears of Russian enterprises is comparable to tax arrears of other transitional economies, we can interpret empirical correlation between wage payments and tax payments as an indirect evidence that enterprise use wage arrears to pressure government structures to receive tax breaks.

Regional liquidity turns out to be a statistically significant factor in the model that uses monthly data and has positive effect on wage arrears. This was expected since high wage arrears in electric power generation and low level of liquidity of this coal-consuming industry causes liquidity problems and wage arrears in coal industry.

Regional average wage arrears and regional average wage level have positive effect on wage arrears in coal enterprises. The sign on the parameter for regional wage level is unexpected since we hypothesized earlier that high wages in the region improve external opportunities of enterprise employees and decrease the ability of the enterprises to underpay wages. This unexpected empirical result could be caused by

measurement problems in the variable "regional average wage" that was taken from statistical reports on social and economic conditions in Kemerovo region and is calculated as an aggregate indicator, thus the method of its calculation in the reports could be inconsistent with the method used for our enterprise-level data on wage arrears.

We conduct Ramsey specification test for the OLS models. We fail to reject the hypothesis of incorrect specification and omitted variables for both datasets – with quarterly and monthly data. Therefore, we need to refine the model, which we do by utilizing the panel nature of our dataset and estimate specifications with enterprise-specific effects.

Columns four and five of Table C-1 contain estimation results for the model with fixed enterprise-specific effects. We also estimated the model specification of random effects, but found no systematic evidence between the two specifications (Hausman test). At the same time, the F-test for joint significance of the estimates for fixed effects indicates that jointly, fixed effects are significantly different from zero.

Parameter estimates for the models with fixed effects are similar in sign to the parameter estimates of the OLS models and support most of the proposed hypotheses (except for our hypothesis on the sign for the effect of regional wage). High profits, high level of sales and high wages in the enterprise tend to lower wage arrears. It is worth noting that the factor that has most pronounced positive effect on wage arrears is regional level of wage arrears, while private ownership has most pronounced negative influence.

**Discrete Choice Models**

Table C-2 presents estimation results for the probit model with random effects.

The best result provides evidence for our hypotheses, we get estimated the

quarterly data model. In our view it is connected with current practice when manager look about the result of work within quarter making strategy of management.

Marginal effects, listed in columns three and five, represent the effect of each explanatory variable on the probability of having wage arrears, *ceteris paribus*. Since all explanatory variables are evaluated at their sample means, the marginal effects are measured as percentage point deviations from the sample mean.

The obtained parameter estimates suggest that factors internal to the enterprise economy – output demand, wage levels in the enterprise and ownership type – are the main determinants for the occurrence of wage arrears. At the same time, factors that characterize external conditions – regional labor market – are statistically insignificant. These results indicate that enterprises decide not to pay wages when they experience financial difficulties. Institutional factors also affect the decision to withhold wages: private ownership decreases the probability of wage non-payments by 10 percentage points (in the model with quarterly data).

Note that variable on profits/losses is insignificant in both versions of the models – with monthly and quarterly data, while the coefficient on enterprise wage level is negative in both models, and significant in the second model. In addition, enterprise wage has the second highest marginal effect (after ownership).

High sensitivity of wage arrears in an enterprise to its wage level can be explained in terms of economic incentives: enterprises that pay higher wages try to stimulate efficiency among their employees. There exist enterprises that do not value the efficiency of their employees as much – these could be enterprises that receive government subsidies or belong to a multi-industry holding company that cross-subsidizes its operations in coal industry from coal export or other industries. It is unclear whether these enterprises maximize profits, operate to “stay alive” or simply

maintain their historical level of production while facing the deficit of funds. This question remains to be answered, though it is clear that the answer is closely related to the problem of wage arrears. Traditional measures of economic performance become only weakly related to actual competitiveness of an enterprise when enterprises act under the conditions of economic crisis and fast changes in the "rules of economic game." This circumstance, in our opinion, explains the conclusion of Alfandari and Schaffer that financial problems of an enterprise are not related to wage arrears. It also explains our result that enterprises do not use profit in their decision-making on whether to withhold wage or not.

As opposed to the efficiency variables, output demand has significant effect on the incidence of wage arrears in all models. It is interesting to note that marginal effects of variable "wage in the enterprise" (employees' incentives for efficient work) and private ownership of the enterprise are higher in absolute value than the effect of the output demand. Top management of Russian coal industry usually names unstable demand for coal and non-payments for shipped coal by electric energy sector as the main factors that drive wage arrears (Solomatin, 2000). Our study suggests that the propensity to withhold wage payments is dependent primarily on the type of ownership in this enterprise and the development of incentive schemes for enterprises.

The last question studied in this paper is as follows: What factors determine the degree of chronic nature of wage non-payments in enterprises?" We divide the enterprises in the sample into three groups by the severity of wage arrears problem and estimate ordered probit model. The parameter estimates are presented it Table C-4.

Estimation results are similar regardless of what dataset we use – monthly or quarterly level data. The results of the estimation supplement conclusions from the

previous specifications. The degree of the chronic nature of wage arrears is sensitive to the level of wages in the enterprise and output demand. We confirm the result of the previous literature (Lehmann, et al, 1999, Earle and Sabirianova, 2000) that regional wage levels are an important determinant of the chronic nature of wage non-payments. Parameter estimates indicate that enterprises base their decisions of whether to withhold wages or not on the conditions of local labor markets. Developed regional labor markets and most importantly, employee mobility, can keep enterprises from withholding wages.

**Conclusions**

In conclusion we would like to stress one more time that despite certain improvements in overdue wage payments observed in the last two years, mechanisms that cause the incidence of wage arrears continue to exist. Enterprises still consider withholdings of wage payments as acceptable means of combating financial crisis.

In this situation issues of wage arrears, particularly in the regions with certain social tensions such as Kuzbas, are frequently exploited by different interest groups to advocate their own agenda. For example, there exist a widely spread opinion among the opponents of privatization that one of the reasons for wage non-payments in coal industry is that coal enterprises, which gained the ability to make their own decisions as a result of market reforms, offer wages that are unreasonably high. Our study indicates that the data reject this hypothesis because high wage levels in an enterprise tend to be associated with lower incidence of wage arrears.

The mains findings of our work are as follows. First, wage arrears in coal industry are determined to a large degree by institutional factors, rather than the output demand. These institutional factors include the type of ownership, as well as

the incentives for the enterprises to increase efficiency of their employees, which is directly related to the general efficiency of the enterprise. This result suggests economic policies that should help eliminate wage arrears in the industry and social tensions associated with this problem. These policies involve institutional reforms that make the conditions of economic activity for the enterprises incentive-based and transparent. These reforms should be based on pro-active privatization of government property and stimuli for the development of private enterprises.

Second, in the long-term, an enterprise that makes its decision to pay or withhold wages relies in this decision on the conditions of local labor markets. Therefore, we can suggest another direction for economic policy that should ease the problem of wage arrears and force enterprises to pay wages on time. This direction includes measures that develop local labor markets and increase mobility of labor force between enterprises and industries.

**Bibliography**

Астахов А.С. Опыт и уроки реструктуризации угольной отрасли. Экономическая наука современной России.2001,1

Соломатин А.Г. О топливной политике в электроэнергетике. Топливная политика в электроэнергетике, РАО «ЕЭС России», Научно-методический сборник,2000

Commander, Q. Fan, and M.E. Schaffer (eds.), Enterprise Restructuring and Economic Policy in Russia, Washington: The World Bank, 1996.

Booth, A.L. (1995), The Economics of the Trade Union, Cambridge University Press .

Desai, Padma, and Idson, Todd, "Wage Arrears, Poverty, and Family Survival Strategies in Russia" Columbia University Economics Department Discussion Paper Series, No.9899-05, New York, Oct. 1998.

Green, William H., Econometric Analysis, 3rd ed. Upper Saddle River, NJ: Prentice Hall, 1997.

Clarke, S. (ed.), The Russian Enterprise in Transition: Case Studies, Edward Elgar, Cheltenham, 1996.

Clarke, S, Trade Union and Non-payment of Wages in Russia (mimeo., 1997)

Commander,S., and J. McHale, «Worker Influence and Employment Bias in a Transitional Firm» paper prepared for the EERC Report, 1998.

Earle, J.S., and K. Sabirianova, "Undestanding Wage Arrears in Russia" draft, December 6, 1998.

John S. Earle and Klara Z. Sabirianova "Equilibrium Wage Arrears: Institutional Lock-In of Contractual Failure in Russia" working paper number 321, June 2000

Gimpelson, V., and D. Lippoldt, "Labor Restructuring in Russian Enterprises: A Case :udy," Paris: OECD, 1996.

Gilles Alfandari, Mark E. Schaffer,""Arrears" in the Russian Enterprise Sector", March 1996, CERT,working paper.

Layard, R., and A. Richter, "How Much Unemployment is Needed for Restlucturing: The Russian Experience," Economics of Transition, March 1995, Vol. 3, # 1, pp. 3^-58.

Verbeek, M, "A Guide to Modern Econometrics" ,2000

Lehmann, H., J. WadswortAh, and A. cquisti, "Grime and Punishment: Job Insecurity and Wage Arrears in the Russian Federation," typescript, March 1998,

Lehmann, H., J. Wadsworth, and Yemtsov, R., "Wage Arrears and the Distribution of Earnings in Russia", Bonn, mimeo, September 2000, revised.

**APPENDIX A**

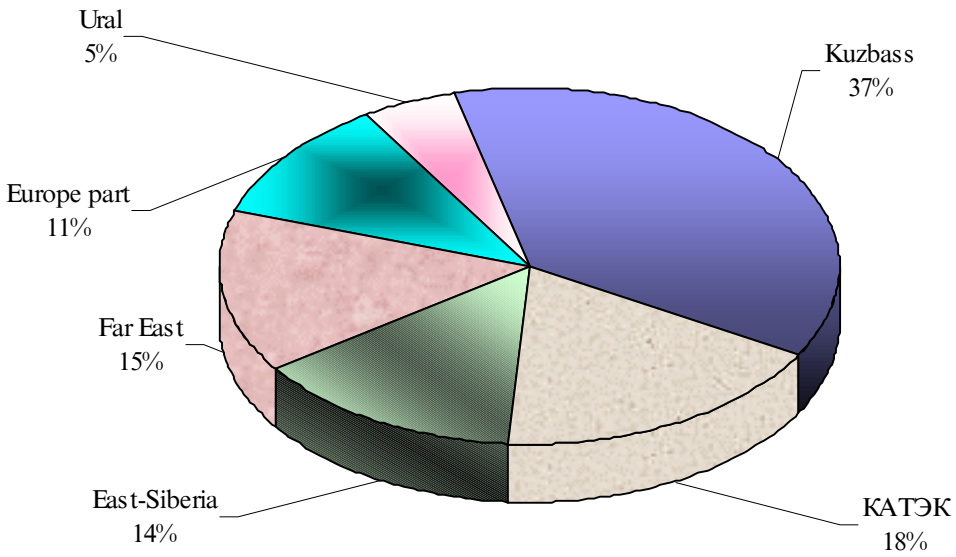


**fig.1**

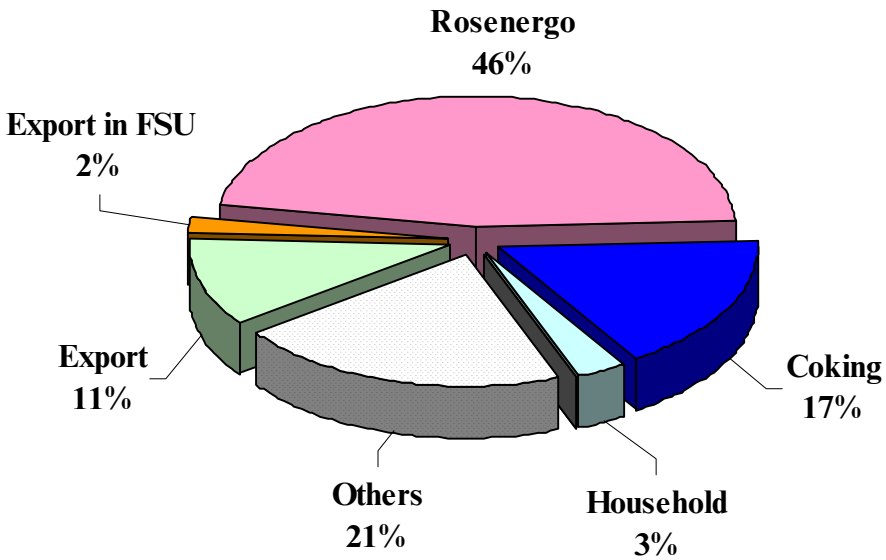


**fig. 2**

Table A -1

**Showing Financial and Economic Activity of Coal Output in Kuzbas**

| Showing | 1996 | 1997 | 1998 |
|---|---|---|---|
| Coal output, million ton | 93,9 | 92,1 | 97,2 |
| Labor productivity, ton | 65,1 | 73,4 | 80,6 |
| Cost price of one ton, rubs. | 135,1 | 134,6 | 123,0 |
| Prime Costs, rubs. | 130,5 | 131,0 | 122,6 |
| Wages, rubs. | 1505 | 1612 | 1661 |
| Notes payable, million rubs. | 6991 | 7746 | 8064 |
| Bill payable, million rubs. | 14511 | 19141 | 19841 |
| Stale payables to budget, million rubs. | 3675 | 6670 | 6125 |
| including fine | 906 | 2890 | 2325 |
| Wage arrears, million rubs.. | 933 | 1053 | 820 |
| Budgetary financing, million rubs. | 2431 | 2020 | 1734 |
| including implementation of tariff deal | 390 | 134 | 70 |
| measures on closing unprofitable mines | 270 | 356 | 416 |
| investment | 1128 | 520 | 220 |
| selective support of loss-making enterprises | 278 | 161 | 578 |

Table A-2

**Wage Arrears Connected with Lack of Budgetary Financing From Budgets of All Levels, %, to total amount, 1998**

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Share of non-payments from budgets of all levels | 1,34 | 1,04 | 0,97 | 1,06 | 0,69 | 0,74 | 0,48 | 0,69 | 0,796 | 1,14 | 1,39 | 1,399 |

Table A-3

**Showing Economic Activity of Sample Firms in Kuzbas**

| Year | Number private firms | Wage arrears in month wage bill | Number profitable firms | Profit per employee, thousand rubs | Bill payable per employee, thousand rubs | Price of one ton, rubs |
|---|---|---|---|---|---|---|
| 96.12 | 10 | 2,9 | 26 | 9,2 | 13,0 | 146,1111 |
| 97.12 | 10 | 3,5 | 24 | 8,7 | 23,7 | 149,2469 |
| 98.12 | 19 | 3,8 | 29 | 11,4 | 46,8 | 173,8612 |
| 99.12 | 26 | 2,3 | 31 | 30,5 | 119,1 | 422,3032 |

**APPENDIX B**

Table B-1

List of regression variables

1. DEPENDENT VARIABLES

All performance money measures are calculated in constant prices of January 1996.

| | |
|---|---|
| WA | - wage arrears |
| NONLOGIT | - 1, if debt was increasing and 0 in absence of increase or if wage debt decreased |

2. INDEPENDENT VARIABLES

| | |
|---|---|
| OWNERSHIP | - 1, fully private ownership and 0, if not |
| PAYABLE | - stale payables to budget per one employed |
| PROFIT | - profit/loss per one employed |
| SALE | - volume of sales per one employed |
| WAGE | - wage |
| WCITY | - average city (district) wage |
| WACITY | - average city (district ) wage arrears |
| NONLIQUID | - wage arrears in electric power production per one employed |

Table B-2

## Summary Tables of Statistics, 1996 г.

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|---|---|---|---|---|---|
| str | 1308 | 0.0489297 | 0.2158035 | 0 | 1 |
| wa | 1065 | 5.844212 | 10.23106 | 0.0234597 | 168.8619 |
| wam | 975 | 5.460461 | 9.394862 | 0.0234597 | 168.8619 |
| priv | 1308 | 0.1330275 | .3397344 | 0 | 1 |
| kr | 1166 | 15.87732 | 15.59546 | 0.2063482 | 199.2279 |
| profit | 1180 | -15.97534 | 118.864 | -1594.841 | 107.5312 |
| w | 1241 | 1.56445 | 0.792951 | 0.0626239 | 17.03515 |
| vso | 1093 | 7.793608 | 8.321659 | 0.0195246 | 135.2878 |
| vd | 1088 | 0.0547091 | 0.0494727 | 0.0007003 | 0.6172839 |
| nonluqid | 1254 | 0.0113638 | 0.0120657 | 0.0001824 | 0.059176 |
| wcity | 1308 | 1244.845 | 228.3241 | 678 | 1870.855 |
| wacity | 1308 | 1.12645 | 0.5612579 | 0.0011367 | 5.183572 |
| waem | 1199 | 4.364731 | 2.588052 | 0.3968254 | 8.737499 |
| unem | 1308 | 2.438532 | 1.114877 | 0.6 | 4.9 |
| wae | 1308 | 4.70392 | 2.722555 | 0.3968254 | 8.737499 |

Table B-3

## Summary Tables of Statistics, 1998 г.

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|---|---|---|---|---|---|
| str | 1140 | .0570175 | 0.2319779 | 0 | 1 |
| wa | 1044 | 13.08788 | 16.46982 | 0 | 273.6096 |
| wam | 957 | 12.54889 | 15.25492 | 0 | 273.6096 |
| priv | 1140 | 0,3368421 | 0,4728378 | 0 | 1 |
| kr | 1034 | 64,80634 | 170,3769 | 0 | 4333,547 |
| profit | 1036 | -8,805924 | 88,37203 | -1580 | 961,4073 |
| w | 1007 | 2.609305 | 1.413113 | 0.0199324 | 12.33254 |
| vso | 1060 | 11,53909 | 20,70029 | 0 | 541,7405 |
| vd | 983 | 0,0701156 | 0,056683 | 0.0012019 | 0.5621622 |
| nonliquid | 1060 | .0384147 | 0,0388526 | 0.000162 | 0,1888917 |
| wcity | 1140 | 1881.575 | 685.4101 | 820.5571 | 4682.167 |
| wacity | 1140 | 7032.009 | 2576.831 | 1200.367 | 15441.67 |
| unem | 1140 | 2.063158 | 1.038881 | 0.7 | 4.5 |
| share | 1140 | 83.15236 | 6.41153 | 35.31157 | 91.33858 |
| wae | 1140 | 7953.847 | 1096.464 | 6296.89 | 9778.003 |
| waem | 1045 | 7788.015 | 990.6121 | 6296.89 | 9360.199 |

Appendix C
Table C-1.

## Determinants of Wage Arrears

OLS and Fixed Effects Models. Dependent variable: flow wage arrears per employee.
$WA_t'$

| | Monthly | Quarterly | Monthly | Quarterly |
|---|---|---|---|---|
| | OLS | OLS | FE | FE |
| | Coefficient | Coefficient | Coefficient | Coefficient |
| OWNERSHIP | -1.4073 (0.2496)*** | -1.4948 (0.5067)*** | -3.0573 (0.3735)*** | -3.6203 (0.7887)*** |
| WAGE | -0.5894 (0.1319)*** | -0.6534 (0.2098)*** | -0.4701 (0.1141)*** | -0.6182 (0.1859)*** |
| PROFIT | -0.0410 (0.0051)*** | -0.0400 (0.0089)*** | -0.0439 (0.0045)*** | -0.0434 (0.0084)*** |
| SALE | -0.1153(0.0054)*** | -0.0989 (0.0299)*** | -0.0846 (0.0159)*** | -0.0629 (0.0310)* |
| PAYABLE | 0.0511(0.0054)*** | 0.0485 (0.0102)*** | 0.0396 (0.0054)*** | 0.0333 (0.0108)*** |
| LIQUID | 0.2154 (0.0622)*** | 0.0907 (0.1867) | 0.2985 (0.0458)*** | 0.2419 (0.1490) |
| WACITY | 1.1928 (0.0668)*** | 1.2875 (0.1351)*** | 1.0613 (0.0607)*** | 1.2111 (0.1287)*** |
| WCITY | 0.0010 (0.00025)*** | 0.0015 (0.0005)*** | 0.0006 (0.0002)*** | 0.0011 (0.0004)** |
| CONS | 1.4863 (0.4895)*** | 1.9383 (1.2385) | 1.761295(0.3636)*** | 1.7552 (0.9504) |
| Nom (categories) | | | 69 | 69 |
| Number of observations | 2415 | 759 | 2415 | 759 |
| R-sq (overall) | 0.4780 | 0.4311 | 0.4639 | 0.4132 |
| Ramsey RESET test | F(3,2403)=12.36;Prob>F=0.0000 | F(3,747)=7.19;Prob>F=0.0006 | | |
| F –test, joint significant time dummy | F(11,2403)=0.84; Prob>F=0.6745 | F(3,747)=1.17; Prob>F=0.3190 | | |
| Hausman test | | | chi2(8)=6.98;Prob>chi2=0.5383 | chi2(8)=5.91;Prob>chi2=0.6568 |
| F test that all u_i=0 | | | F(68,2338)=33.36;Prob>F=0.000 | F(68,682)=9.37;Prob>F=0.0000 |

***Significant at the 1%, ** significant at the 5%, * significant at the 10%, standard error in parentheses

Table C-2

## Determinants of the Incidence of Wage Arrears

Probit Random Effects Model. Dependent variable: Incidence of wage arrears.

| | Monthly | | Quarterly | |
|---|---|---|---|---|
| | Probit, RE | | Probit, RE | |
| | Coefficient | Marginal effect | Coefficient | Marginal effect |
| OWNERSHIP | -0.2035 (0.0974) | -0.0804 | -0.7302 (0.3181)** | -0.1056** |
| WAGE | -0.0044 (0.0420) | -0.0017 | -0.3283 (0.1108)*** | -0.0475** |
| PROFIT | -0.0029 (0.0016) | -0.0012 | -0.0082 (0.0039) | -0.0012 |
| SALE | -0.0202(0.0052)*** | -0.0079** | -0.0306(0.0132)** | -0.0044** |
| PAYABLE | -0.0021(0.0018) | -0.0008 | 0.0017 (0.0066) | 0.00025 |
| LIQUID | 0.0309 (0.0173) | 0.0122 | 0.0257 (0.0978) | 0.0037 |
| WACITY | 0.0433 (0.0215) | 0.0171 | 0.1288 (0.0816) | 0.0186 |
| WCITY | 0.0001 (0.00007) | 0.00003 | 0.0001(0.0002) | 0.00003 |
| CONS | -0.0078 (0.1423) | | 3.4505(0.7525)*** | |
| Nom (categories) | 69 | | 69 | |
| Number of observations | 2415 | | 759 | |
| Wald test | Wald chi2(8)=48.92;Prob>chi2=0.0000 | | Wald chi2(8)=36.96;Prob>chi2=0.0000 | |
| Log Likelihood | -1586.5139 | | -145.06797 | |

***Significant at the 1%, ** significant at the 5%, * significant at the 10%, standard error in parentheses

Table C-3.

## Determinants of the Incidence of Wage Arrears

Logit Fixed Effects Model. Dependent variable: Incidence of wage arrears.

| | Monthly | | Quarterly | |
|---|---|---|---|---|
| | Logit, FE | | Logit, FE | |
| | Coefficient | Marginal effect | Coefficient | Marginal effect |
| OWNERSHIP | -0.5202 (0.2367) | -0.1262 | -0.4290 (0.4310) | -0.1048 |
| WAGE | -0.0803 (0.0731) | -0.0195 | -0.1127 (0.1041) | -0.0276 |
| PROFIT | -0.0055 (0.0028) | -0.00136 | -0.0086 (0.0048) | -0.0210 |
| SALE | -0.0247(0.0103) | -0.0059 | -0.0325(0.0176) | -0.0079 |
| PAYABLE | -0.0051(0.0033) | -0.0012 | -0.0031 (0.0059) | -0.00076 |
| LIQUID | 0.0675 (0.0285)** | 0.0163** | -0.0955 (0.0854) | -0.0233 |
| WACITY | 0.0309 (0.0382) | 0.0075 | 0.1560 (0.0727)** | 0.0382** |
| WCITY | 0.0001 (0.00007) | 0.0001 | 0.0007(0.00002)*** | 0.00018*** |
| Nom (categories) | 69 | | 68 | |
| Number of observations | 2415 | | 748 | |
| Wald test | Wald chi2(8)=26.43;Prob>chi2=0.0009 | | Wald chi2(8)=31.49;Prob>chi2=0.0001 | |
| Log Likelihood | -1378.5146 | | -328.6919 | |

***Significant at the 1%, ** significant at the 5%, * significant at the 10%, standard error in parentheses